EMCal: Effect of material
(in the acceptance of PWO EMCal)
Part 2

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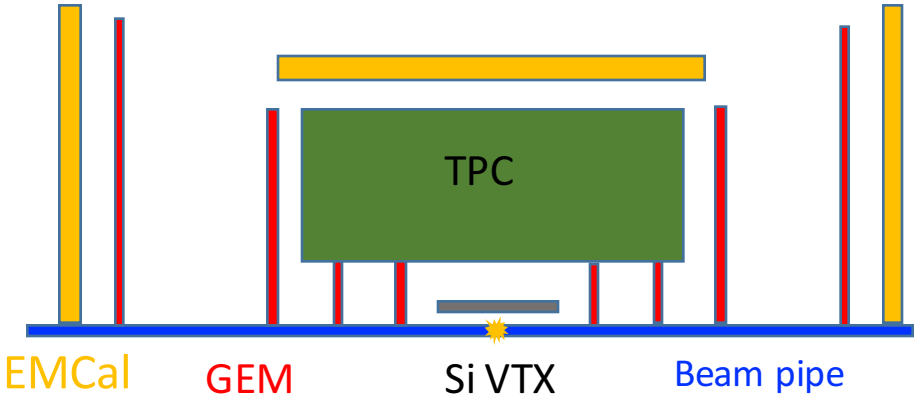
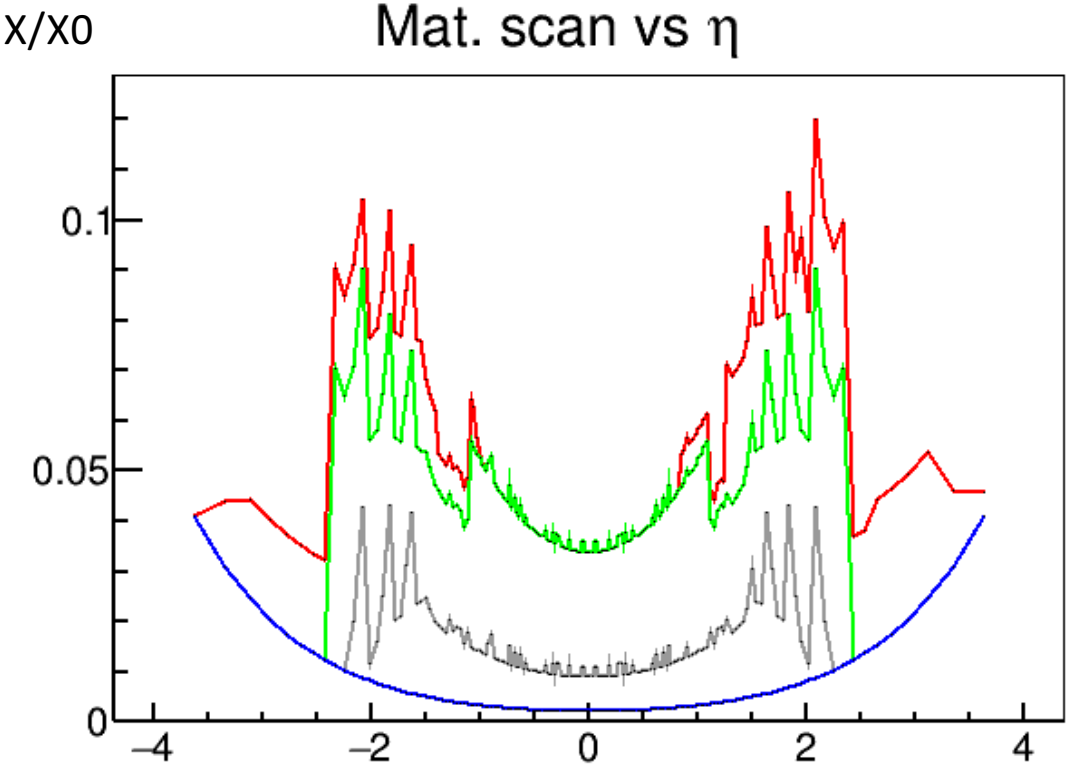
EIC-YR-Calorimetry meeting

July 14, 2020

Set up



No PID detectors
No support/service material

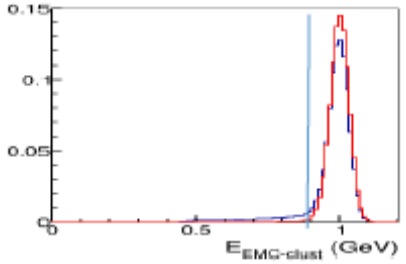


Beam pipe
Vertex Si
TPC
Endcup GEMs

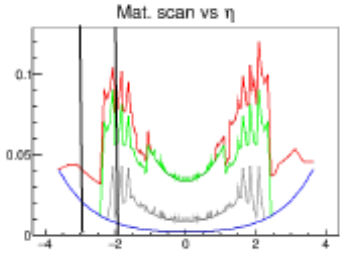
GEM: ~0.7% of X0 per plane

From my last presentation

"Efficiency" of *e* reco

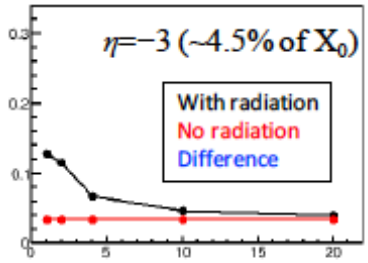


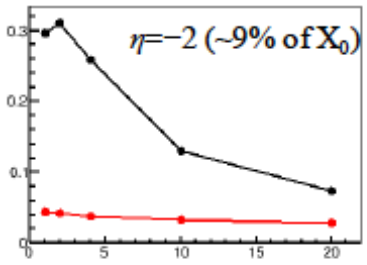
$E_{EMC} > E_{nom} - 2\,\sigma_{EMC}$



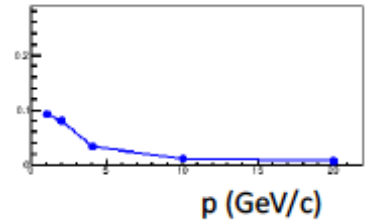
How electron is "modified" as seen by the EMCal

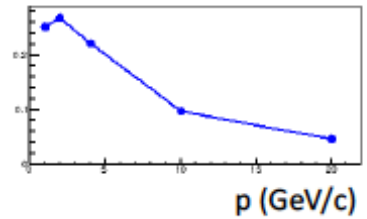
Losses vs p (GeV/c)





Expected to be 2.3% for a pure gaussian response





Huge effect from η=−3 to η=−2

8

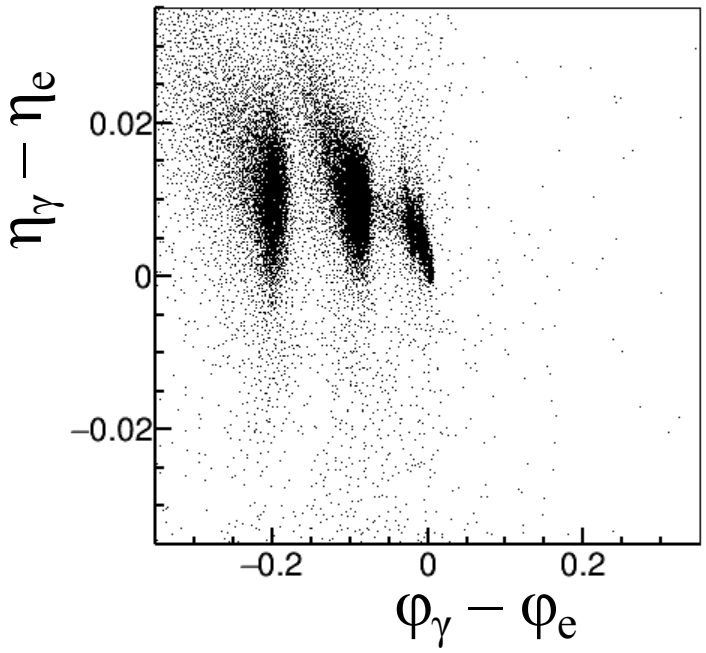
How can we recover the lost eff.?

Radiated photon topology

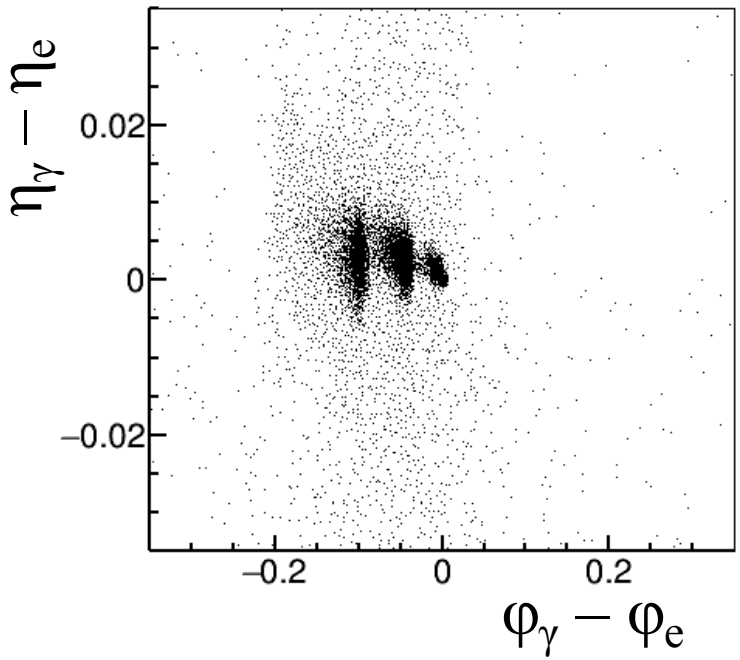
Radiated photon relative electron position at the EMCal

$\eta = 2$

2 GeV/c



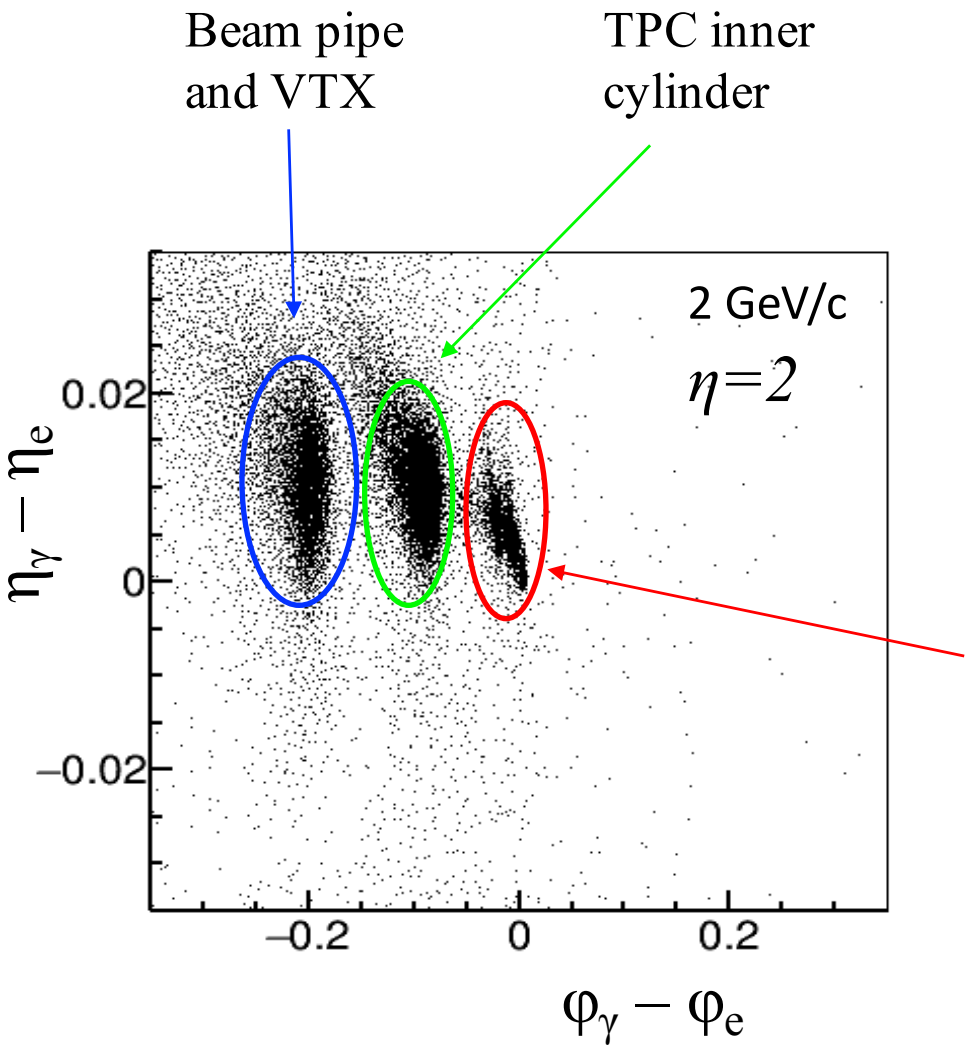
4 GeV/c

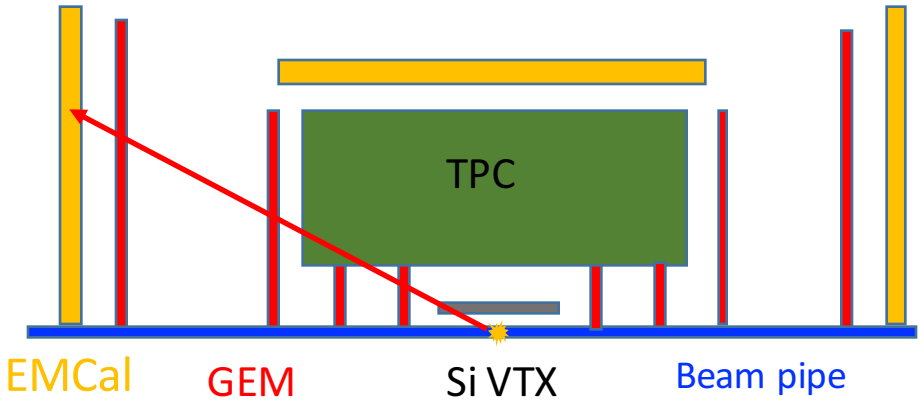


Radiated photons are distributed relative to a parent electron:

- Nearly at the same η
- At negative φ

Radiated photon topology



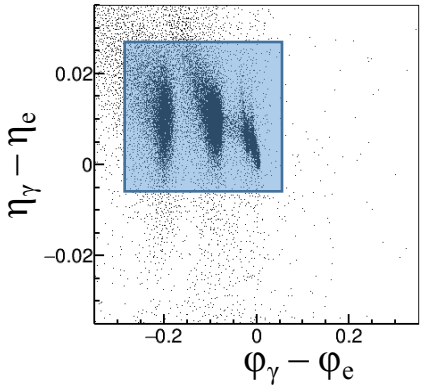


Outer GEMs

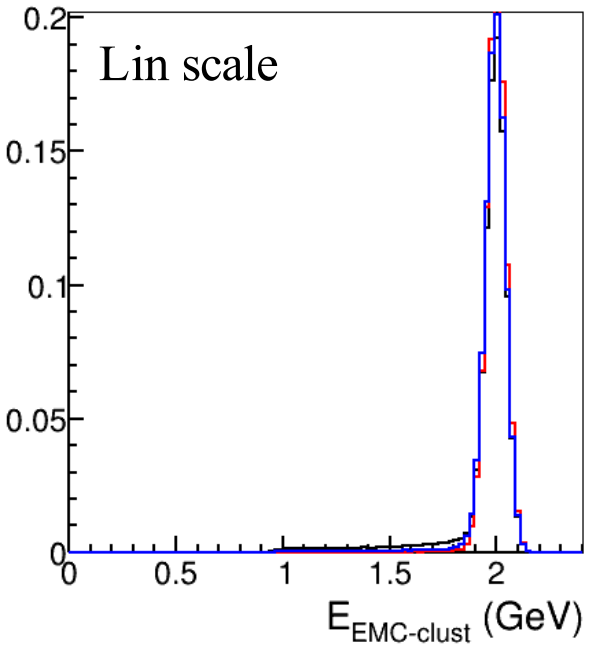
We know quite precisely where to look for radiated photons

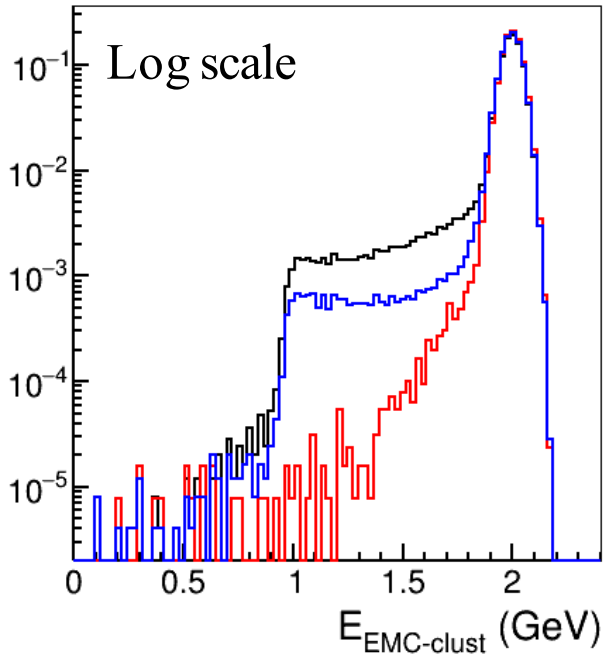
How EMCal measures electrons

Single electrons generated
Maximal EMCal energy cluster shown (in PWO)



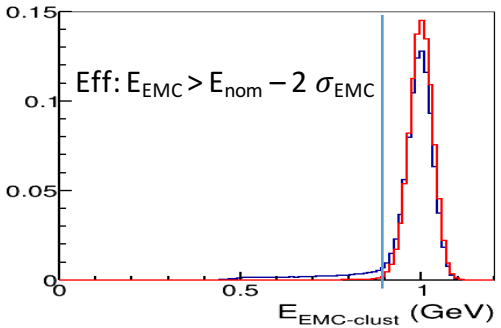
2 GeV/c at η=−3



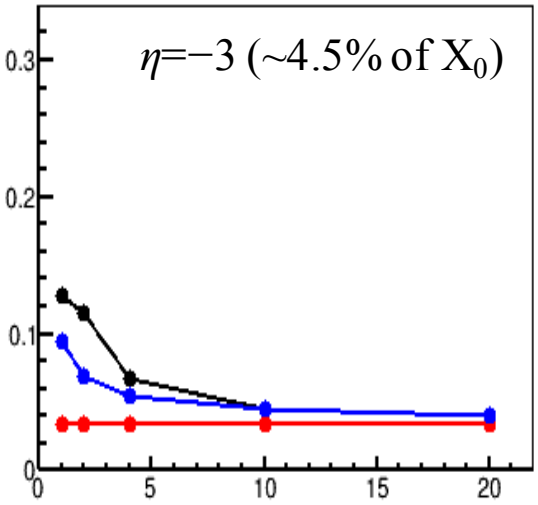


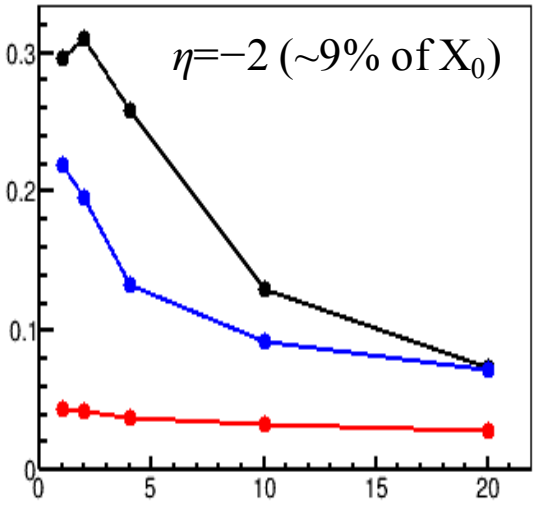
No radiation
With radiation
With radiation:
Photon blobs included

“Efficiency” of *e* reco



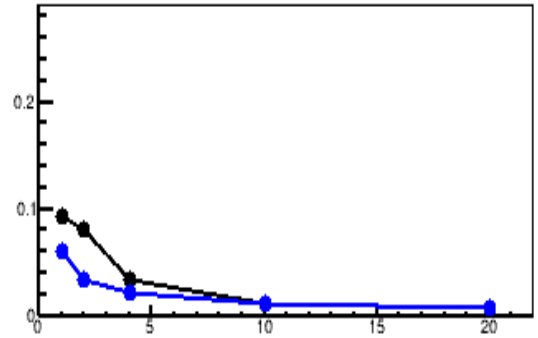
Losses vs p (GeV/c)

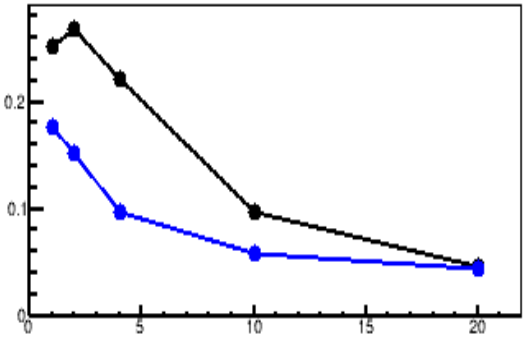




No radiation
With radiation
With radiation:
photon blobs included

Difference with red points





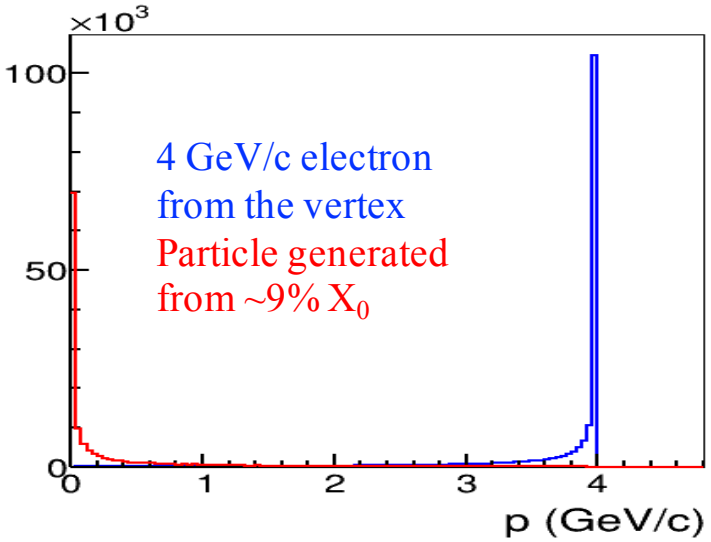
Smarter algorithms may recover more of the eff. loss

However, need to estimate the possible bias due to background particle

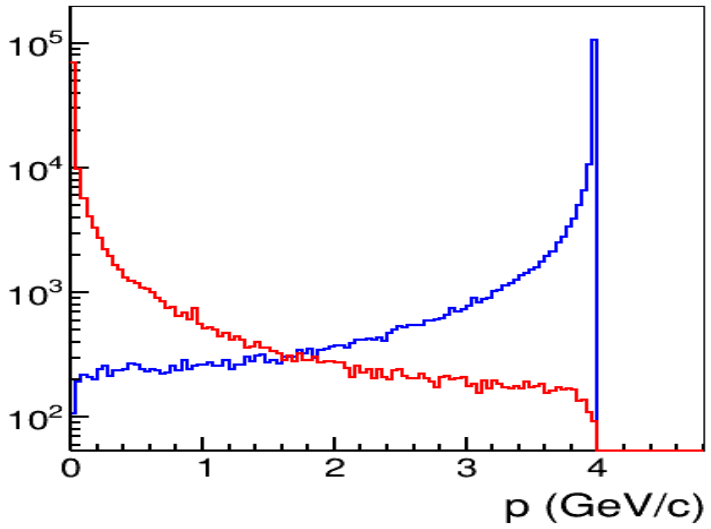
A comment on electron tracking

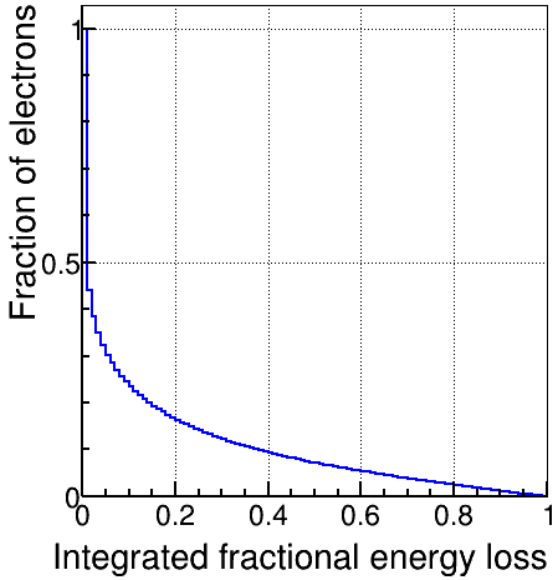
4 GeV/c at η=2

Lin. scale



Log. scale

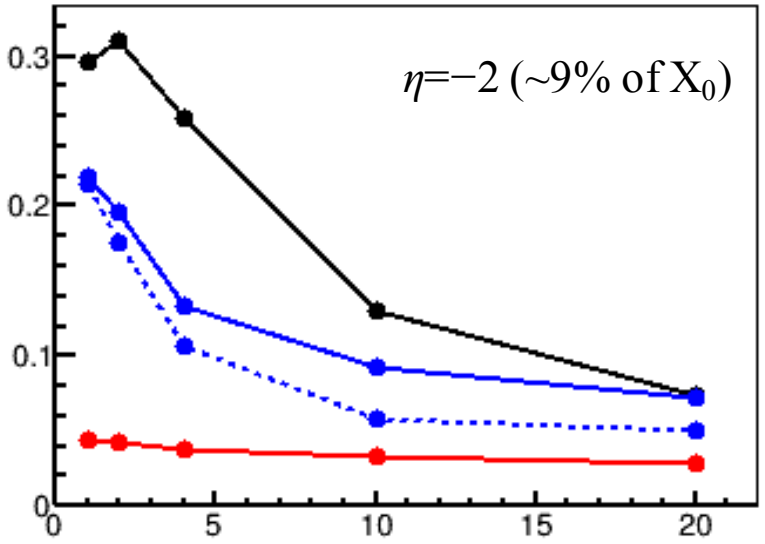


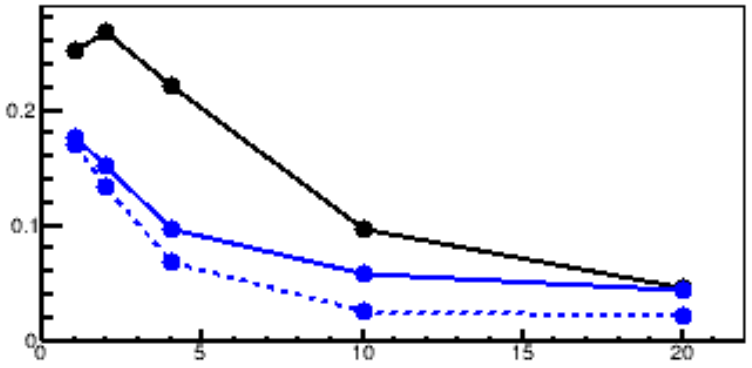


E.g.: 24% (7%) of electrons will radiate >10% (>50%) of their energy

How does tracking perform for electrons radiating energy along the track?

Backup





No radiation

With radiation

Solid: With radiation: photons included

Dashed: + track poinitng